Microprocessor Supervisory Circuit in 4-Lead SOT-143 with DSP

ADM811/ADM812

FEATURES

Superior upgrade for MAX811/MAX812
Specified over temperature
Low power consumption: 5 µA typical
Precision voltage monitor: 2.5 V, 3 V, 3.3 V, 5 V options
Reset assertion down to 1 V_{CC}
Power-on reset: 140 ms minimum
Logic low $\overline{\text{RESET}}$ output (ADM811)
Logic high RESET output (ADM812)
Built-in manual reset

APPLICATIONS

Microprocessor systems
Controllers
Intelligent instruments
Automotive systems
Safety systems
Portable instruments

FUNCTIONAL BLOCK DIAGRAM

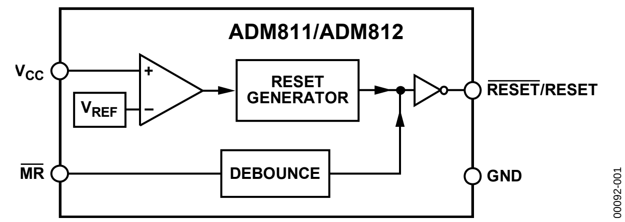


Figure 1.

GENERAL DESCRIPTION

The ADM811/ADM812 are reliable voltage monitoring devices suitable for use in most voltage monitoring applications. The ADM811/ADM812 are designed to monitor six different voltages, each allowing a 5% or 10% degradation of standard PSU voltages before a reset occurs. These voltages have been selected for the effective monitoring of 2.5 V, 3 V, 3.3 V, and 5 V supply voltage levels.

Included in this circuit is a debounced manual reset input. Reset can be activated using an electrical switch (or an input from another digital device) or by a degradation of the supply voltage. The manual reset function is very useful, especially if the circuit in which the ADM811/ADM812 are operating enters into a state that can only be detected by the user. Allowing the user to reset a system manually can reduce the damage or danger that could otherwise be caused by an out-of-control or locked system.

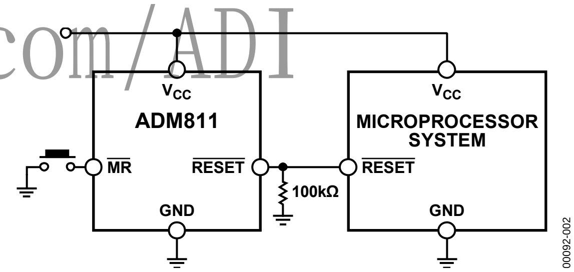


Figure 2. Typical ADM811 Operating Circuit

Rev. E

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REVISION HISTORY

5/08—Rev. D to Rev. E

Changes to Table 2 ... 4
Changes to Outline Dimensions ... 9
Changes to Ordering Guide ... 10

5/06—Rev. C to Rev. D

Changes to Ordering Guide ... 9

2/03—Rev. B to Rev. C

Changes Features ... 1
Changes to General Description ... 1
Changes to Specifications ... 2
Removed Note 2 from Ordering Guide ... 3
Changes to Pin Function Descriptions ... 4
Removed Note from Table I ... 6

1/03—Rev. A to Rev. B

Added ADM812 ... Universal
Changes to Specifications ... 2
Changes to Ordering Guide ... 3
Changes to Pin Configuration ... 4
Changes to Pin Function Description ... 4
Additions to Table I ... 6
Changes to Manual Reset section ... 6

5/02—Rev. 0 to Rev. A

Deletion of ADM812 ... Universal

SPECIFICATIONS

V_{CC} = full operating range; $T_A = T_{MIN}$ to T_{MAX}; V_{CC} typical = 5 V for L/M models, 3.3 V for T/S models, 3 V for R model, 2.5 V for Z models, unless otherwise noted.

Table 1.

Parameter	Min	Typ	Max	Unit	Test Conditions/Comments
SUPPLY					
Voltage	1.0		5.5	V	T_A = 0°C to 70°C
	1.2			V	T_A = −40°C to +85°C
Current		8	15	µA	V_{CC} < 5.5 V, ADM81xL/M, I_{OUT} = 0 mA
		5	10	µA	V_{CC} < 3.6 V, ADM81xR/S/T/Z, I_{OUT} = 0 mA
RESET VOLTAGE THRESHOLD					
ADM81xL	4.54	4.63	4.72	V	T_A = 25°C
ADM81xL	4.50		4.75	V	T_A = −40°C to +85°C
ADM81xM	4.30	4.38	4.46	V	T_A = 25°C
ADM81xM	4.25		4.50	V	T_A = −40°C to +85°C
ADM81xT	3.03	3.08	3.14	V	T_A = 25°C
ADM81xT	3.00		3.15	V	T_A = −40°C to +85°C
ADM81xS	2.88	2.93	2.98	V	T_A = 25°C
ADM81xS	2.85		3.00	V	T_A = −40°C to +85°C
ADM81xR	2.58	2.63	2.68	V	T_A = 25°C
ADM81xR	2.55		2.70	V	T_A = −40°C to +85°C
ADM81xZ	2.28	2.32	2.35	V	T_A = 25°C
ADM81xZ	2.25		2.38	V	T_A = −40°C to +85°C
RESET THRESHOLD TEMPERATURE COEFFICIENT		30		ppm/°C	
V_{CC} TO RESET/$\overline{\text{RESET}}$ DELAY		40		µs	V_{OD} = 125 mV, ADM81xL/M
		20		µs	V_{OD} = 125 mV, ADM81xR/S/T/Z
RESET ACTIVE TIMEOUT PERIOD	140		560	ms	$V_{CC} = V_{TH(MAX)}$
	300		700	ms	ADM811-3T only
MANUAL RESET					
Minimum Pulse Width	10			µs	
Glitch Immunity		100		ns	
RESET/$\overline{\text{RESET}}$ Propagation Delay		0.5		µs	
Pull-Up Resistance	10	20	30	kΩ	
The Manual Reset Circuit Acts On					
An Input Rising Above	2.3			V	$V_{CC} > V_{TH(MAX)}$, ADM81xL/M
An Input Falling Below			0.8	V	$V_{CC} > V_{TH(MAX)}$, ADM81xL/M
An Input Rising Above	$0.7 \times V_{CC}$			V	$V_{CC} > V_{TH(MAX)}$, ADM81xR/S/T/Z
An Input Falling Below			$0.25 \times V_{CC}$	V	$V_{CC} > V_{TH(MAX)}$, ADM81xR/S/T/Z
RESET/$\overline{\text{RESET}}$ Output Voltage					
Low (ADM812R/S/T/Z)			0.3	V	$V_{CC} = V_{TH(MAX)}$, I_{SINK} = 1.2 mA
Low (ADM812L/M)			0.4	V	$V_{CC} = V_{TH(MAX)}$, I_{SINK} = 3.2 mA
High (ADM812R/S/T/Z/L/M)	$0.8 \times V_{CC}$			V	1.8 V < V_{CC} < $V_{TH(MIN)}$, I_{SOURCE} = 150 µA
Low (ADM811R/S/T/Z)			0.3	V	$V_{CC} = V_{TH(MIN)}$, I_{SINK} = 1.2 mA
Low (ADM811L/M)			0.4	V	$V_{CC} = V_{TH(MIN)}$, I_{SINK} = 3.2 mA
Low (ADM811R/S/T/Z/L/M)			0.3	V	V_{CC} > 1.0 V, I_{SINK} = 50 µA
High (ADM811R/S/T/Z)	$0.8 \times V_{CC}$			V	$V_{CC} > V_{TH(MAX)}$, I_{SOURCE} = 500 µA
High (ADM811L/M)	$V_{CC} \times 1.5$			V	$V_{CC} > V_{TH(MAX)}$, I_{SOURCE} = 800 µA

ABSOLUTE MAXIMUM RATINGS

Typical values are at T_A = 25°C, unless otherwise noted.

Table 2.

Parameter	Rating
Terminal Voltage (With Respect to Ground)	
V_{CC}	−0.3 V to +6 V
All Other Inputs	−0.3 V to V_{CC} + 0.3 V
Input Current	
V_{CC}	20 mA
$\overline{MR}$	20 mA
Output Current	
$\overline{RESET}$	20 mA
Power Dissipation (T_A = 70°C)	
RA-4 (SOT-143)	200 mW
Derate by 4 mW/°C Above 70°C	
θ_{JA} Thermal Impedance	330°C/W
Operating Temperature Range	−40°C to +85°C
Storage Temperature Range	−65°C to +160°C
Lead Temperature (Soldering, 10 sec)	300°C
Vapor Phase (60 sec)	215°C
Infrared (15 sec)	220°C
ESD Rating	3 kV

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ESD CAUTION

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

PIN CONFIGURATION AND FUNCTION DESCRIPTIONS

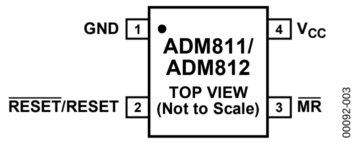


Figure 3. Pin Configuration

Table 3. Pin Function Descriptions

Pin No.	Mnemonic	Description
1	GND	Ground Reference For All Signals, 0 V.
2	$\overline{\text{RESET}}$ (ADM811)	Active Low Logic Output. $\overline{\text{RESET}}$ remains low while V_{CC} is below the reset threshold or when $\overline{\text{MR}}$ is low; $\overline{\text{RESET}}$ then remains low for at least 140 ms (at least 300 ms for the ADM811-3T) after V_{CC} rises above the reset threshold.
	RESET (ADM812)	Active High Logic Output. RESET remains high while V_{CC} is below the reset threshold or when $\overline{\text{MR}}$ is low; RESET then remains high for 240 ms (typical) after V_{CC} rises above the reset threshold.
3	$\overline{\text{MR}}$	Manual Reset. This active low debounced input ignores input pulses of 100 ns or less (typical) and is guaranteed to accept input pulses of greater than 10 µs. Leave floating when not used.
4	V_{CC}	Monitored Supply Voltage of 2.5 V, 3 V, 3.3 V, or 5 V.

TYPICAL PERFORMANCE CHARACTERISTICS

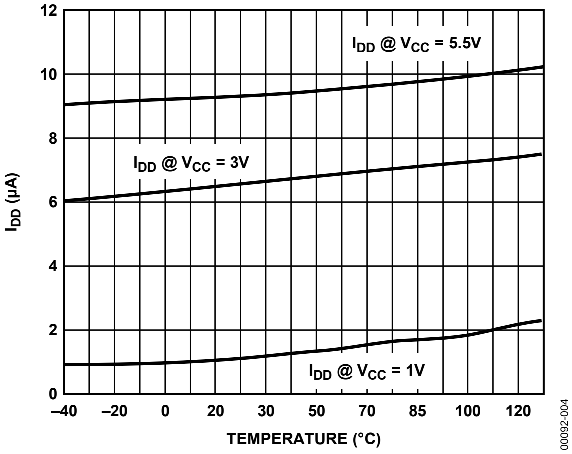


Figure 4. Supply Current vs. Temperature (ADM81xR/S/T/Z)

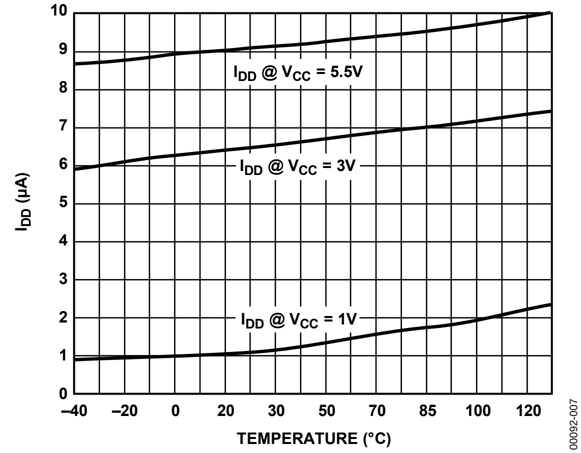


Figure 7. Supply Current vs. Temperature (ADM81xL/M)

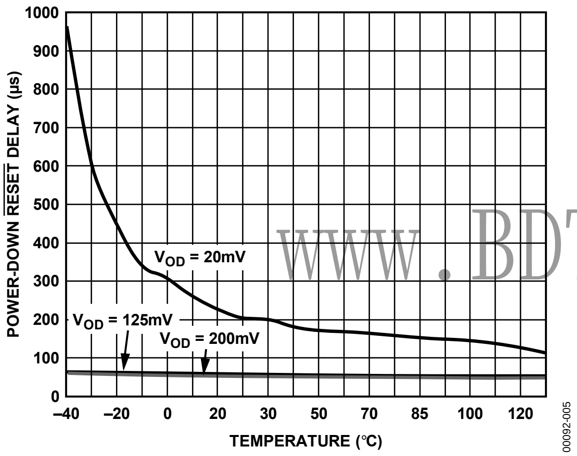


Figure 5. Power-Down $\overline{\text{RESET}}$ Delay vs. Temperature (ADM81xR/S/T/Z)

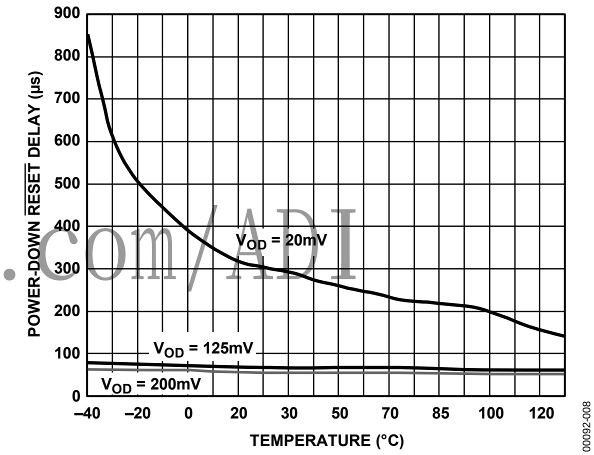


Figure 8. Power-Down $\overline{\text{RESET}}$ Delay vs. Temperature (ADM81xL/M)

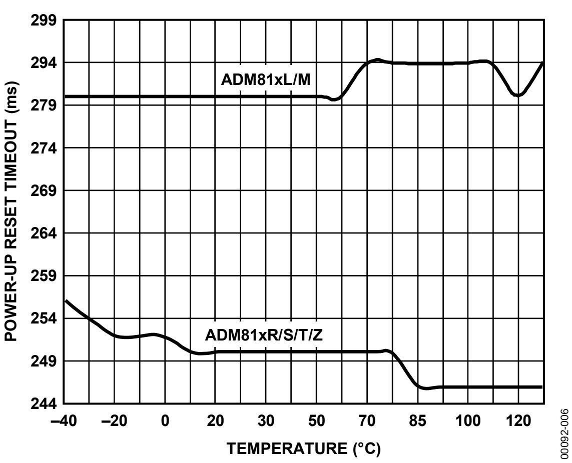


Figure 6. Power-Up RESET Timeout vs. Temperature

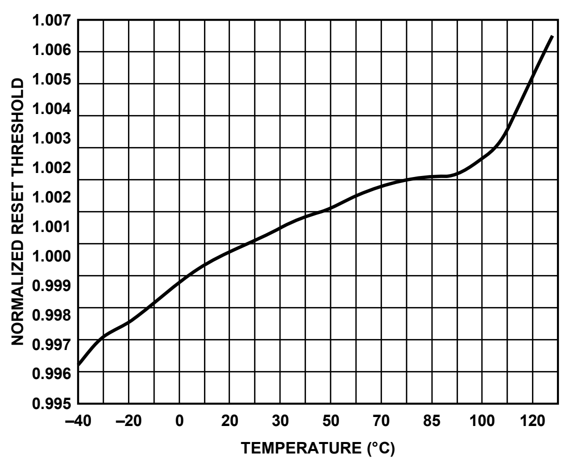


Figure 9. RESET Threshold Deviation vs. Temperature

CIRCUIT INFORMATION

RESET THRESHOLDS

A reset output is provided to the microprocessor whenever the V_{CC} input is below the reset threshold. The actual reset threshold depends on whether an L, M, T, S, R, or Z suffix is used (see Table 4).

Table 4. Reset Threshold Options

Model	Reset Threshold (V)
ADM811LART	4.63
ADM811MART	4.38
ADM811TART	3.08
ADM811-3TART	3.08
ADM811SART	2.93
ADM811RART	2.63
ADM811ZART	2.32
ADM812LART	4.63
ADM812MART	4.38
ADM812TART	3.08
ADM812SART	2.93
ADM812RART	2.63
ADM812ZART	2.32

RESET OUTPUT

On power-up and after V_{CC} rises above the reset threshold, an internal timer holds the reset output active for 240 ms (typical). This is intended as a power-on reset signal for the processor. It allows time for both the power supply and the microprocessor to stabilize after power-up. If a power supply brownout or interruption occurs, the reset output is similarly activated and remains active for 240 ms (typical) after the supply recovers. This allows time for the power supply and microprocessor to stabilize.

The ADM811 provides an active low reset output ($\overline{\text{RESET}}$) while the ADM812 provides an active high output (RESET).

During power-down of the ADM811, the $\overline{\text{RESET}}$ output remains valid (low) with V_{CC} as low as 1 V. This ensures that the microprocessor is held in a stable shutdown condition as the supply falls and also ensures that no spurious activity can occur via the microprocessor as it powers up.

MANUAL RESET

The ADM811/ADM812 are equipped with a manual reset input. This input is designed to operate in a noisy environment where unwanted glitches could be induced. These glitches could be produced by the bouncing action of a switch contact, or where a manual reset switch may be located some distance away from the circuit (the cabling of which can pick up noise).

The manual reset input is guaranteed to ignore logically valid inputs that are faster than 100 ns and to accept inputs longer in duration than 10 µs.

GLITCH IMMUNITY

The ADM811/ADM812 contain internal filtering circuitry providing glitch immunity from fast transient glitches on the power supply line.

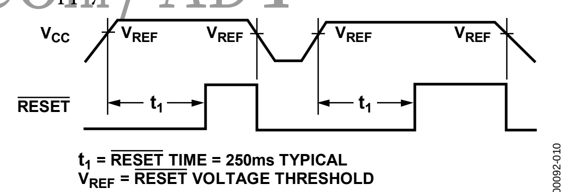


Figure 10. Power Fall $\overline{\text{RESET}}$ Timing

INTERFACING TO OTHER DEVICES

OUTPUT

The ADM811/ADM812 are designed to integrate with as many devices as possible. One feature of the ADM811/ADM812 is the reset output, which is directly proportional to V_{CC} (this is guaranteed only while V_{CC} is greater than 1 V). This enables the part to be used with both 3 V and 5 V, or any nominal voltage within the minimum and maximum specifications for V_{CC}.

BENEFITS OF A VERY ACCURATE RESET THRESHOLD

Because the ADM811/ADM812 can operate effectively even when there are large degradations of the supply voltages, the possibility of a malfunction during a power failure is greatly reduced. Another advantage of the ADM811/ADM812 is its very accurate internal voltage reference circuit. Combined, these benefits produce an exceptionally reliable microprocessor supervisory circuit.

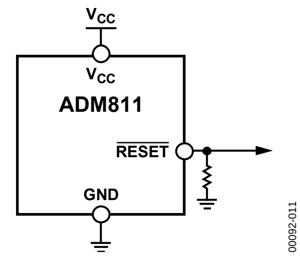
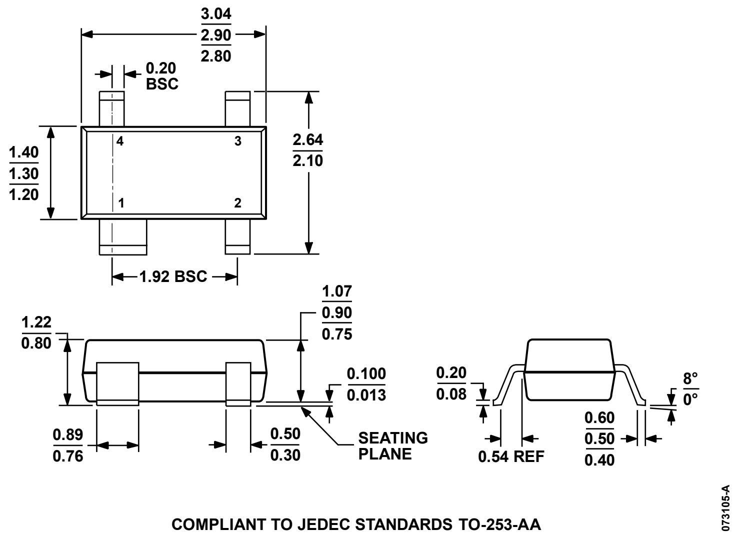


Figure 11. Ensuring a Valid $\overline{\text{RESET}}$ Output Down to V_{CC} = 0 V

ENSURING A VALID $\overline{\text{RESET}}$/RESET OUTPUT DOWN TO V_{CC} = 0 V

When V_{CC} falls below 0.8 V, the $\overline{\text{RESET}}$/RESET of the ADM811/ADM812 no longer sinks current. Therefore, a high impedance CMOS logic input connected to $\overline{\text{RESET}}$/RESET can drift to undetermined logic levels. To eliminate this problem, a 100 kΩ resistor should be connected from $\overline{\text{RESET}}$/RESET to ground.

OUTLINE DIMENSIONS



COMPLIANT TO JEDEC STANDARDS TO-253-AA

Figure 12. 4-Lead Small Outline Transistor Package [SOT-143]
(RA-4)
Dimensions shown in millimeters

ORDERING GUIDE

Model[1]	Reset Threshold (V)	Temperature Range	Ordering Quantity	Package Description	Package Option	Branding
ADM811LART-REEL	4.63	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	MBV
ADM811LART-REEL7	4.63	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	MBV
ADM811LARTZ-REEL[2]	4.63	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	M4J
ADM811LARTZ-REEL7[2]	4.63	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	M4J
ADM811MART-REEL7	4.38	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	MBT
ADM811MARTZ-REEL[2]	4.38	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	MBT#
ADM811MARTZ-REEL7[2]	4.38	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	MBT#
ADM811TART-REEL	3.08	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	MBG
ADM811TART-REEL7	3.08	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	MBG
ADM811TARTZ-REEL[2]	3.08	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	MBG#
ADM811TARTZ-REEL7[2]	3.08	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	MBG#
ADM811-3TART-REEL7	3.08	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	MB3
ADM811-3TARTZ-RL[2]	3.08	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	M4E
ADM811-3TARTZ-RL7[2]	3.08	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	M4E
ADM811SART-REEL	2.93	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	MBE
ADM811SART-REEL7	2.93	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	MBE
ADM811SARTZ-REEL[2]	2.93	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	MBE#
ADM811SARTZ-REEL7[2]	2.93	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	MBE#
ADM811RART-REEL7	2.63	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	MBB
ADM811RARTZ-REEL[2]	2.63	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	M4N
ADM811RARTZ-REEL7[2]	2.63	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	M4N
ADM811ZART-REEL	2.32	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	MBZ
ADM811ZART-REEL7	2.32	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	MBZ
ADM811ZARTZ-REEL[2]	2.32	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	M6G
ADM811ZARTZ-REEL7[2]	2.32	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	M6G
ADM812LART-REEL	4.63	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	MCV
ADM812LART-REEL7	4.63	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	MCV
ADM812LARTZ-REEL[2]	4.63	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	M5D
ADM812LARTZ-REEL7[2]	4.63	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	M5D
ADM812MART-REEL	4.38	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	MCT
ADM812MART-REEL7	4.38	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	MCT
ADM812MARTZ-REEL[2]	4.38	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	M6D
ADM812MARTZ-REEL7[2]	4.38	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	M6D
ADM812TART-REEL7	3.08	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	MCG
ADM812TARTZ-REEL[2]	3.08	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	M68
ADM812TARTZ-REEL7[2]	3.08	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	M68
ADM812SART-REEL	2.93	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	MCE
ADM812SART-REEL7	2.93	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	MCE
ADM812SARTZ-REEL[2]	2.93	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	M67
ADM812SARTZ-REEL7[2]	2.93	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	M67
ADM812RART-REEL	2.63	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	MCB
ADM812RART-REEL7	2.63	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	MCB
ADM812RARTZ-REEL[2]	2.63	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	M6F
ADM812RARTZ-REEL7[2]	2.63	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	M6F
ADM812ZART-REEL	2.32	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	MCZ
ADM812ZART-REEL7	2.32	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	MCZ
ADM812ZARTZ-REEL[2]	2.32	−40°C to +85°C	10,000	4-Lead SOT-143	RA-4	M69
ADM812ZARTZ-REEL7[2]	2.32	−40°C to +85°C	3,000	4-Lead SOT-143	RA-4	M69

[1] Only available in reels.
[2] Z = RoHS Compliant Part, # denotes RoHS compliant may be top or bottom marked.

NOTES

NOTES